

electrically insulative. Since the force 46 is capable of being released or removed, the electrical structure of FIG. 3 facilitates repairing or upgrading in the field because substrates 32 and 34 can be readily decoupled by release or removal of the force 46.

In an embodiment of the present invention, the dielectric core 40, the dielectric jacket 44, and the conductive wiring 42 are each sufficiently compressible so as to accommodate up to about 8 mils of composite variability that includes a planarity of a surface 25 of the substrate 32 and a planarity of a surface 26 of the substrate 34 which is opposite the surface 25 of the substrate 32. For example, if the substrate 32 is an electronic module then the variability in planarity of the surface 25 may be in a range of about ½ mil to about 6 mils, and if the substrate 34 is a printed wiring board then the variability in planarity of the surface 26 may be in a range of about ½ mil to about 2 mils. Thus, the dielectric core 40, the dielectric jacket 44, and the conductive wiring 42 are each compressible in a direction that is parallel to an axis of the button (i.e., in a direction 54 or 55).

The dielectric material of the dielectric core 40 or the dielectric jacket 44 may be an elastomer, and a compliance of an elastomer is related to material hardness on the Shore scale. Accordingly, the dielectric material of the dielectric core 40 or of the dielectric jacket 44 may, in particular embodiments of the present invention, have a hardness between about 37A and about 56D on the Shore scale.

Representative materials for the dielectric core 40 or the dielectric jacket 44 include: polytetrafluoroethylene (PTFE), expanded polytetrafluoroethylene, Hylene® TPE 9300C (Dupont), Hytrel® 4069 (Dupont), Teflon® PFA 350 (Dupont), Pellethane® 2102 (Dow), GTPO

8202 GITTO Global (Dupont), GTPO 8102 GITTO Global (Dupont), FEP 100 (Dupont),
Chemigum (Goodyear), Versaflex® OM 1040 (GLS Corp.), Dynaflex® G7702 (GLS Corp),
Dynaflex® G7722 (GLS Corp.), Santoprene® 8271-55 (Advanced Elastomer Systems), Dyneon®
FC 2120 3M 5100. The dielectric core **40** and the dielectric jacket **44** may include a same
5 dielectric material or different dielectric materials. In embodiments of the present invention, the
dielectric core **40** has a diameter between about 10 mils and about 20 mils.

Representative materials for the conductive wiring **42** include copper, copper alloys (e.g.,
BeCu, phosphor bronze), nickel, palladium, platinum, and gold. To reduce or eliminate
corrosion, the end contacts **47** and **48** of the conductive wiring **42** may be coated with a noble
10 metal such as, *inter alia*, gold. In embodiments of the present invention, the conductive wiring
42 has a diameter between about 1 mil and about 5 mils.

FIGS. 4-11 depict steps in a fabrication of a conductive button such as the conductive
button **38** in FIG. 3.

FIG. 4 depicts a perspective view of a dielectric core **50**, in accordance with embodiments
15 of the present invention. The dielectric core **50** includes a dielectric material such as the
dielectric material of the dielectric core **40** described *supra* in conjunction with FIG. 3. The
outer surface of the dielectric core **50** has grooves **51** oriented axially in the direction **54** or **55**,
said directions **54** and **55** being parallel to the axis (or axial direction) of the dielectric core **50**.
The grooves **51** accommodate any hyperelasticity of the dielectric core **50** (or of the dielectric
20 jacket **59** in FIG. 8, described *infra*) by providing space for the dielectric material of the
dielectric core **50** to deform into. An alternative to the grooves **51** for accommodating

hyperelasticity of the dielectric core **50** (or of the dielectric jacket **59** in FIG. 8) is an axial through hole in the direction **54** or **55** at a radial center **52** of the dielectric core **50**. The axial through hole may be created by forming the dielectric core **50** around a solid wire and subsequently removing the solid wire to form the through hole. The solid wire provides a stiffening member during formation of the dielectric core **50** and during placement of conductive helical wiring **53** and **56** (see FIG. 5 discussed *infra*). The solid wire may be removed before or after the dielectric core **50** is cut to length (see FIG. 10 and accompanying discussion *infra* relating to cutting conductive rod **60** which contains a dielectric core). The solid wire may be retained within the dielectric core to serve as an additional electrical path between two opposing electrically conductive pads (e.g., pads **33** and **35** of FIG. 3). Another alternative for accommodating the hyperelasticity includes having the dielectric core **50** of FIG. 4 include a foamed material having internal voids or bubbles into which the dielectric material of the dielectric core **50** may deform.

The dielectric material of the dielectric core **50** and dielectric jacket **59** (see FIG. 8) may have other properties, such as: shrinking in length (i.e., in the direction **54** or **55**) during exposure to heat or ultraviolet radiation; or bonding together during exposure to heat or ultraviolet radiation.

FIG. 5 depicts conductive wiring **49** helically wound around the dielectric core **50** of FIG.

4. The conductive wiring **49** includes conductive wiring **53** helically wound in a clockwise direction and conductive wiring **56** helically wound in a counterclockwise direction. The scope of the present invention includes conductive wirings **53** and **56** both present, and alternatively